

**Chemical Principles of Environmental Science 11:375:202**

**Homework 3: Natural Waters**

**Due:** October 28, 2009

**SHOW ALL WORK NEATLY ON A SEPARATE PAGE**

1. In the early Paleozoic era (500 million years ago), the partial pressure of  $\text{CO}_2$  in the Earth's atmosphere is estimated to have been 0.8%, about 20 times higher than current atmospheric levels.

a.(2) Assuming that  $\text{CO}_2$  was the **only source of acid**, estimate the pH of Paleozoic cloud water droplets.

b.(3) Determine the concentrations of  $\text{HCO}_3^-$  in lake surface water in equilibrium with 0.8%  $\text{CO}_2$  at pH 6, 7, and 8.

c.(3) Plot **on one set of axes** the *log of the concentrations* of  $\text{H}_2\text{CO}_3^*$  and  $\text{HCO}_3^-$  (y-axis) vs. pH (x-axis) over the pH range of 6 to 8.

2.(2) Sketch the vertical profile of dissolved Si in the ocean and explain why it has that shape.